

Modeling & Simulation for Emergency Response

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***Process Oriented Framework for
Emergency Response Planning,
Simulation and Execution***

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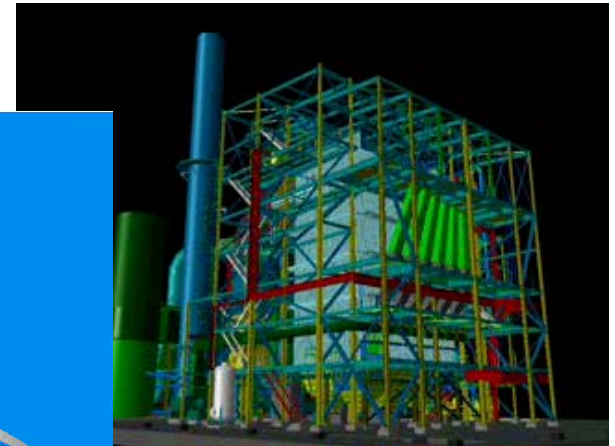
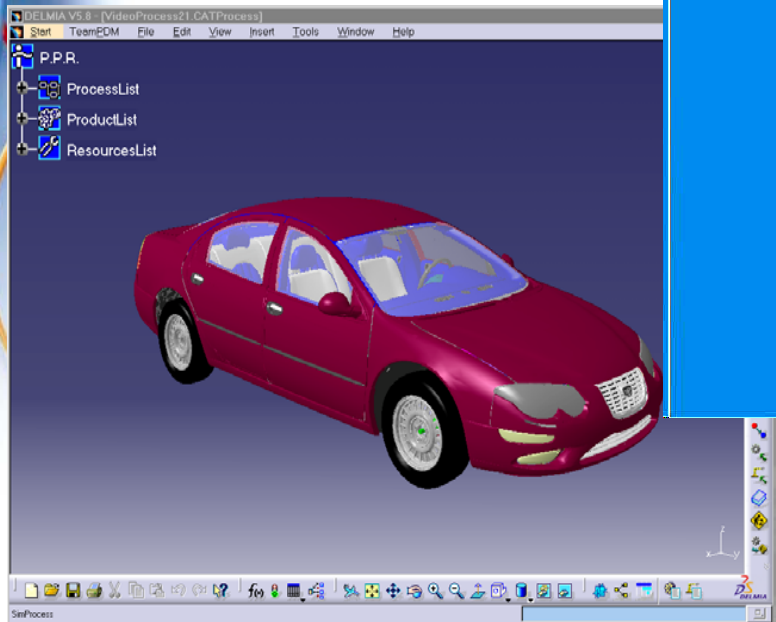
Levels of Emergency Response

- **Emergency response is in most cases a combination of**
 - Zonal / geographic level response (city, state, etc), and
 - Scene/facility level response
 - Some scenes are quite complex:
 - *Airports, harbors and shipyards*
 - *Stadiums, malls, convention centers*
 - *Large office complexes*
 - *Chemical, biotech and pharmaceutical plants*
 - *Power generation facilities*
 - *Refineries and Off shore platforms*
 - *Hospitals*

We will present a solution that can address response planning for highly complex scenes

The Basis for Such a Framework Exists !

- A viable alternative is to utilize a framework based on state of the art Digital Process Modeling solutions already proven for the aerospace, automotive and shipbuilding industries.
- This alternative offers millions of dollars and years of development savings.

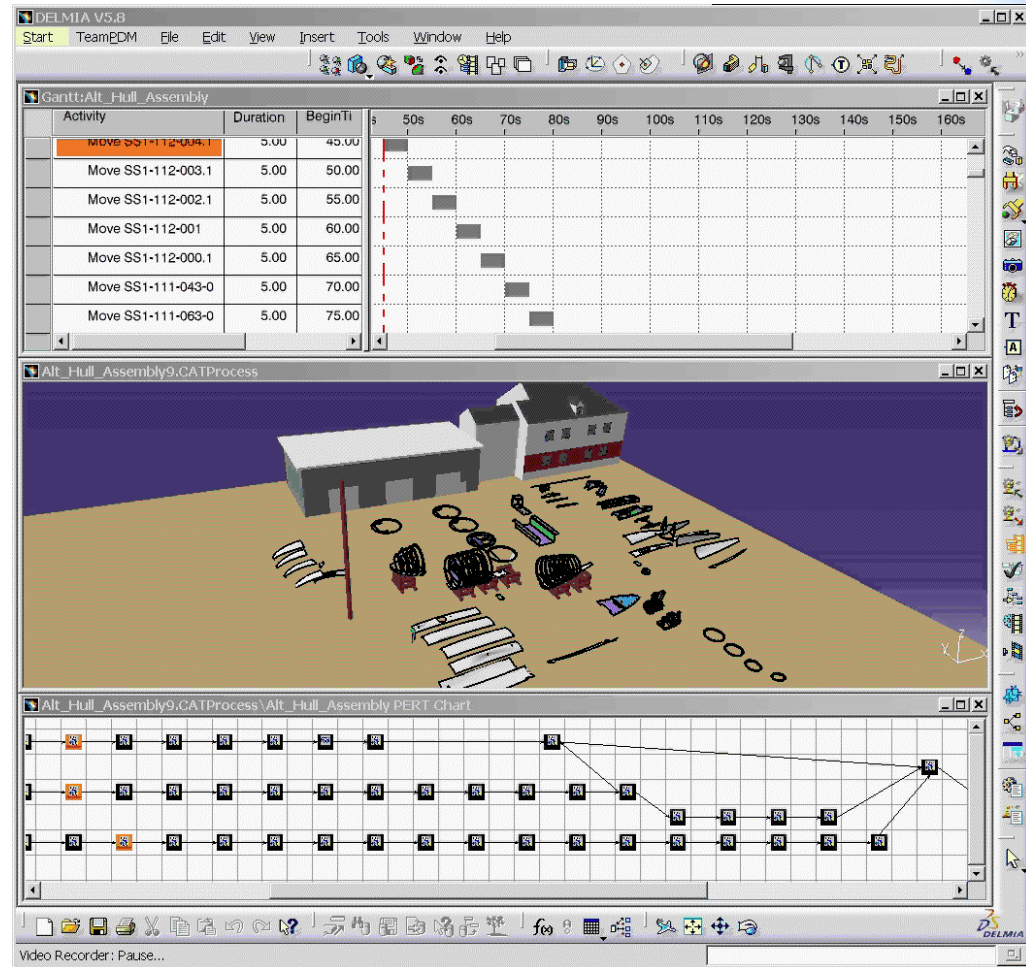


3D Process Modeling and Simulation Techniques are Extensible to Emergency Response Lifecycle

- **Simulation based planning:**
 - To evaluate risk
 - To consider containment and mitigation scenarios
 - To maximize the effectiveness of resources during response
 - To select the most cost efficient recovery and restoration
- **Execution**
 - Real-time updates to model supporting visualization
 - Project possible responses supporting what-if consideration of alternatives
- **Education & training**
 - Train on response plans based on models
- **Future Improvements to Emergency Response**
 - New Methods; New Technologies; New Procedures

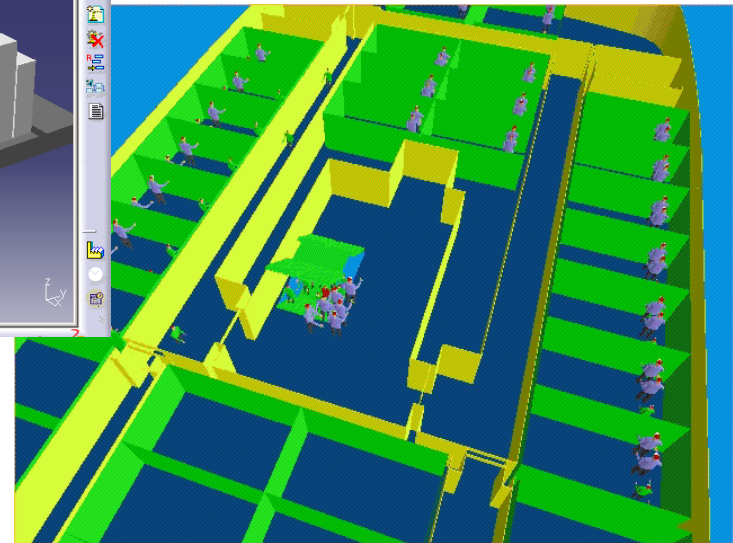
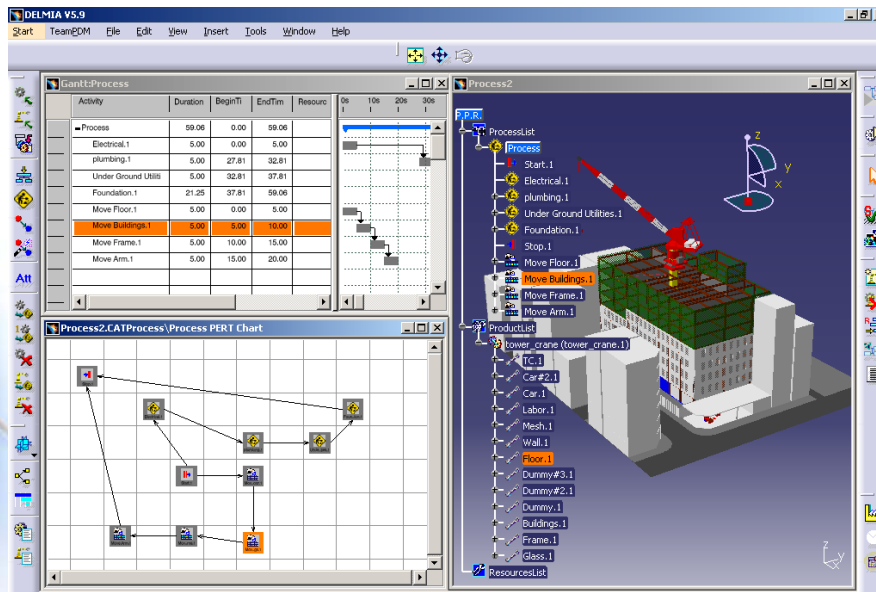
Process Planning and Simulation

- Existing modeling environments for creating and testing plans include
 - Interdependencies
 - Precedence requirements
 - Constraints
 - Time



Interoperability to reduce the cost of Modeling

DELMIA: Digital Process Modeling based on multi-CAD input

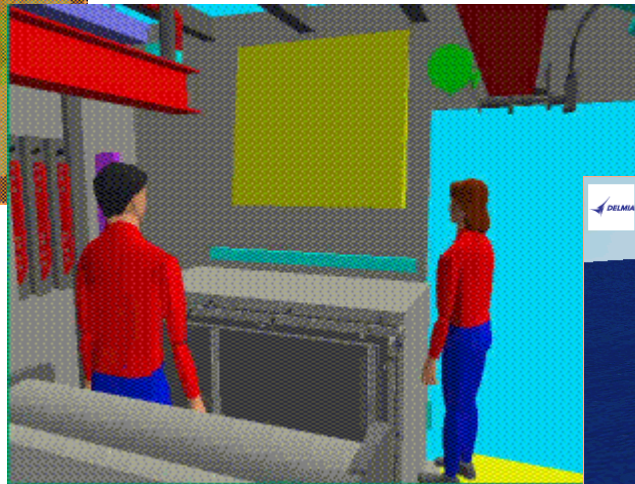


Recent Projects

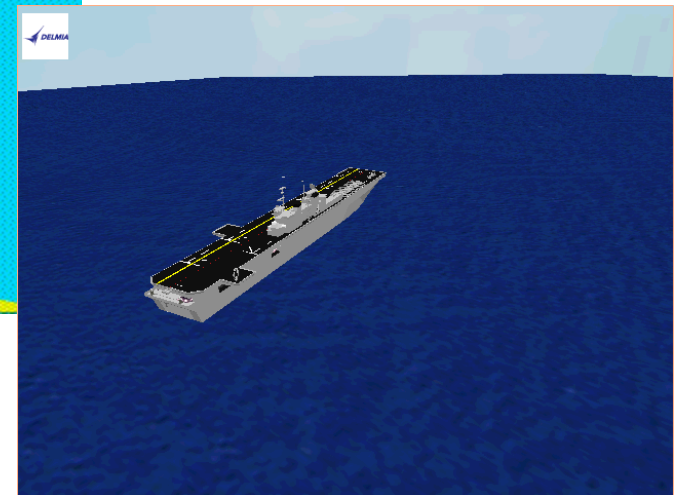
Hazardous waste in a
flooded quarry



Handling torpedoes on
a destroyer



Changing the JSF lift
fan on the hanger deck

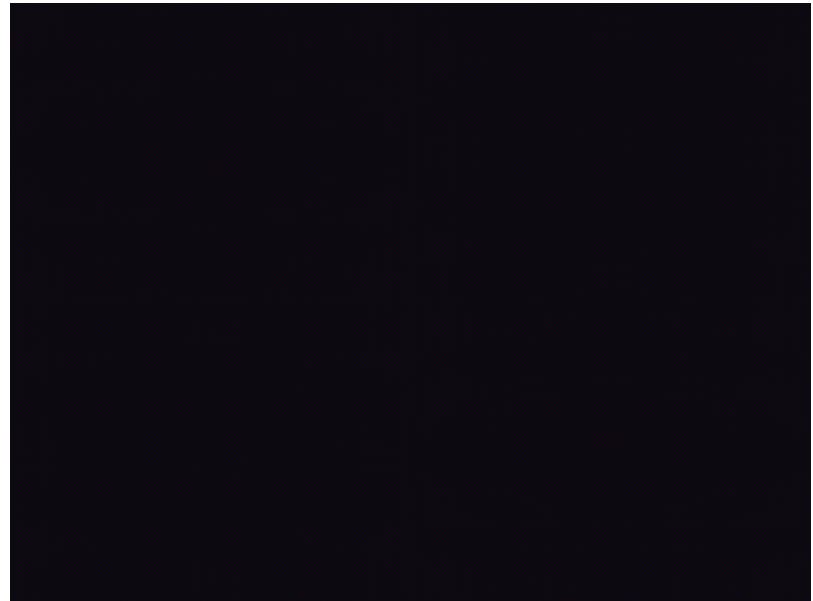


To support process execution models must interface with real time systems

Real time position monitoring

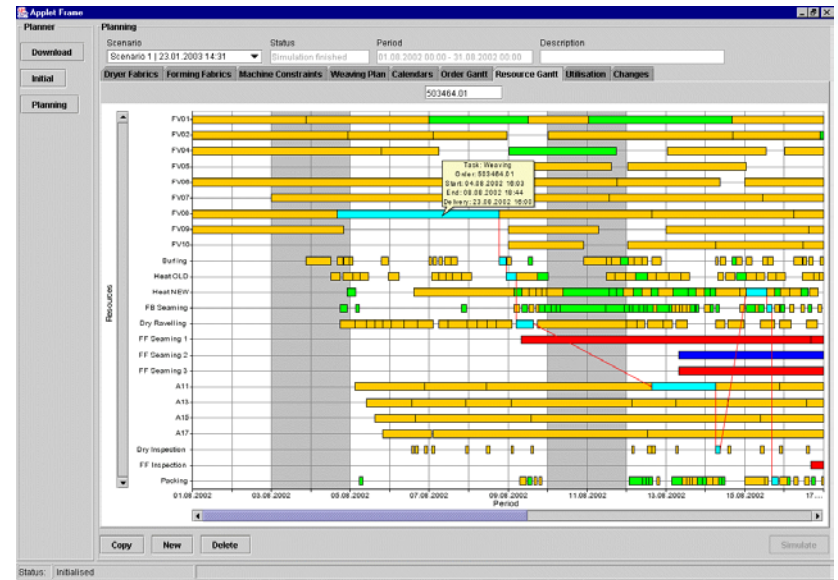
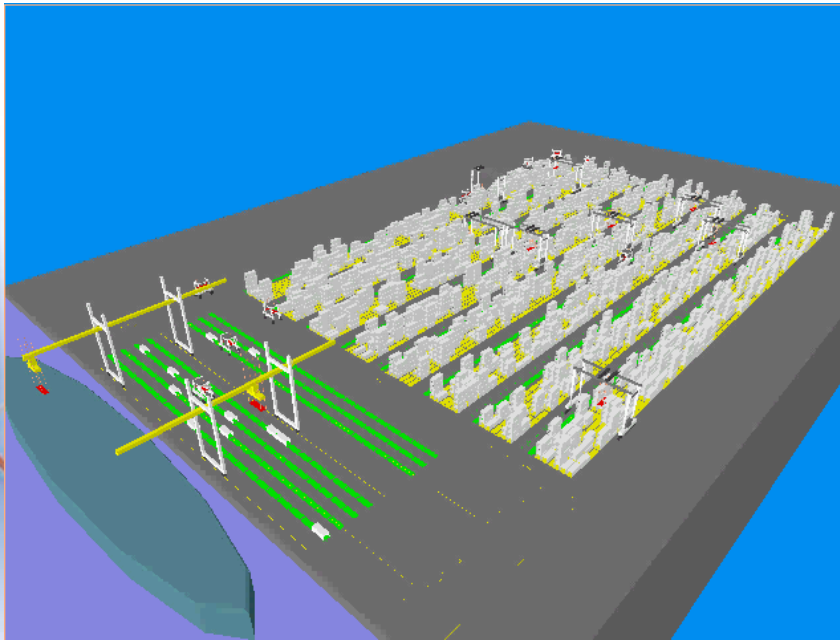


Real time force sensing



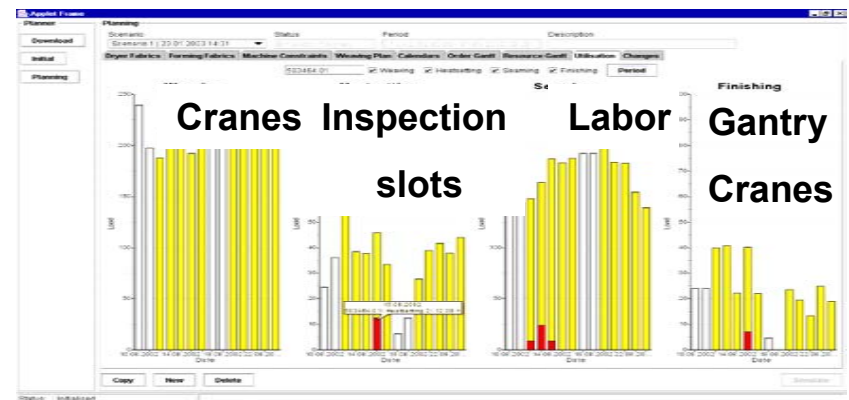
Prevention, for example Container Inspection

Planning & Scheduling



Resource Utilization

DELFOi



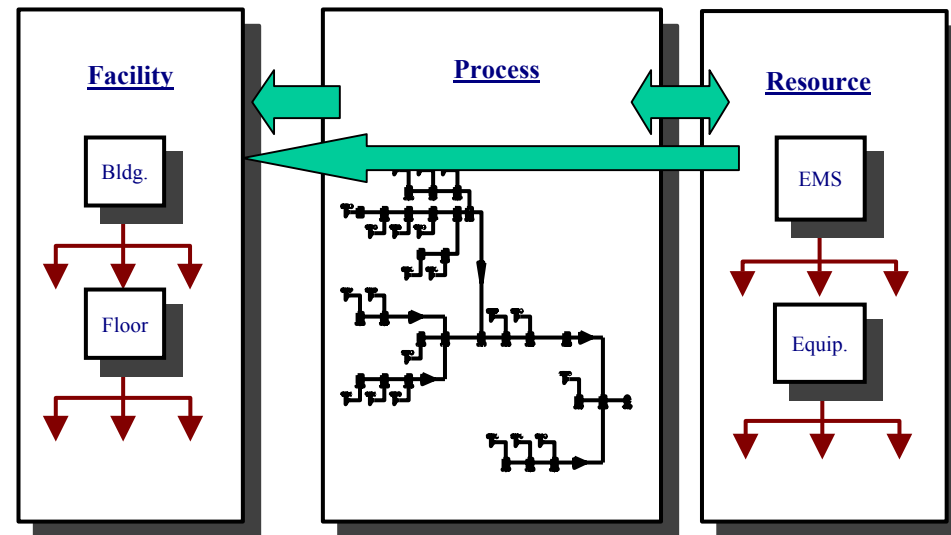
Simulation based training

- Emergency Response workers can use the rich model environment to prepare themselves without physical mock-ups



Need for an Emergency Response Database

- **Elements of the emergency response plans must be stored as individual elements for quick development of plans and re-planning**
 - These already exist in paper form as Emergency Operations Plans, etc.
- Facility models of high risk sites
- Libraries of “best practice” processes with constraints
- Catalogs of resources with attributes
 - *Equipment with manning requirements*
 - *Tools with electrical, hydraulic, cooling water requirements*
 - *Labor with skill requirements and certifications*



Conclusion

- **Effective emergency response requires pre-planning, and the Emergency Response community can benefit from the tremendously powerful tools that have been developed for the aerospace, automotive and shipbuilding industries which can be quickly adapted.**
- **This detailed planning can be integrated with the zonal / geographical level Emergency Planning solutions**
- **The use of an Emergency Response database of reusable Process templates and Resource definitions will dramatically decrease the effort to create and modify plans.**